

## REMARKS

Applicants appreciate the thorough and detailed examination of the present application as evidenced by the Final Action dated August 22, 2006. Applicants further appreciate the indication that the claim rejections under 35 U.S.C. § 112 have been withdrawn and that the new title has been accepted. Applicants provide the comments below to address the issues presented in the Final Action and in support of the patentability of the pending claims.

As noted above, in the event that a Notice of Allowance is not issued in response hereto, the Examiner is respectfully requested to contact the undersigned in order to schedule an interview with Applicants and Applicants' representative.

### **I. Information Disclosure Statement**

The Final Action asserts that the Information Disclosure Statements (IDS) other than the IDS dated 21 December 2004 are not considered in their entirety. As discussed with the Examiner during a teleconference on February 7, 2007, Patent No. 6,706,737 corresponds to the patent application of record. Applicants' representative further directed the Examiner's attention to the Manual of Patent Examining Procedure (M.P.E.P.) §609.02(A)(2), which states the following:

**The examiner will consider information which has been considered by the Office in a parent application when examining (A) a continuation application filed under 37 CFR 1.53(b) \*\* (B) a divisional application filed under 37 CFR 1.53(b) \*\* or (C) a continuation-in-part application filed under 37 CFR 1.53(b). A listing of the information need not be resubmitted in the continuing application unless the applicant desires the information to be printed on the patent.**

M.P.E.P. §609.02(A)(2) (Emphasis added).

As previously noted, the IDS submitted by Applicants included a copy of a form PTO-1449 as filed in parent U.S. Patent Application Serial No. 10/434,259 with the Attorney Docket Number of the parent application struck through and the Attorney Docket number of the present application written thereon. Applicants further note that the references cited in the IDS filed in the present application appear on the face of the issued patent for the parent application, U.S. Patent No. 6,706,737. *See* attached pages 1-3 of the '737 patent.

Accordingly, Applicants reiterate its belief that the USPTO has previously received and/or reviewed the references cited in the IDS, and that Applicants are entitled to have the

references considered, and in the event of allowance, listed on a patent issuing from the present application.

## II. Claims Rejections Under 35 U.S.C. § 102

Claims 65-84 stand rejected under 35 U.S.C. §102(b) as being anticipated by WO 95/32957 to Astra Aktiebolag (hereinafter, "Astra Aktiebolag"). *See* Final Action, page 3. More specifically, the Final Action asserts that "the WO 95/32957 reference does also teach optically pure forms of the active agent (see in particular lines 23-26 on page 3). Final Action, page 9.

Applicants respectfully submit that Astra Aktiebolag does not teach 6-methoxy-2-[(*S*)-(4-methoxy-3,5-dimethyl-2-pyridinyl)methyl]sulfinyl]-1H-benzimidazole in pure form. Instead, on page 3, Astra Aktiebolag refers to ethyl carbonate derivatives (e.g. ethoxycarbonyloxymethyl derivatives) of omeprazole, which is a benzimidazole compound substituted with a carbonyldioxy moiety. On page 4, Astra Aktiebolag discusses single enantiomers of "omeprazole" noting that such compounds have, at that time, only been obtained as syrups and not as crystalline products. Notably, the structure shown is a 5-methoxy benzimidazole compound and not a 6-methoxy benzimidazole compound. Astra Aktiebolag proceeds to indicate that crystalline products can be obtained; however, the compounds obtained are described as pure regioisomers (as single structures or mixtures) specifically noted as N-ethoxycarbonyloxymethyl derivatives, i.e., a 5-methoxy-2-[(4-methoxy-3,5-dimethyl-2-pyridinyl)methyl]sulfinyl]-1H-benzimidazole-*1-ylmethyl ethyl carbonate* isomer and a 6-methoxy-2-[(4-methoxy-3,5-dimethyl-2-pyridinyl)methyl]sulfinyl]-1H-benzimidazole-*1-ylmethyl ethyl carbonate* isomer. *See* page 4. Such compounds do not represent 6-methoxy-2-[(*S*)-(4-methoxy-3,5-dimethyl-2-pyridinyl)methyl]sulfinyl]-1H-benzimidazole in pure form as recited in the pending claims.

"Anticipation under 35 U.S.C. § 102 requires the disclosure in a single piece of prior art of *each and every* limitation of a claimed invention." *Apple Computer Inc. v. Articulate Systems Inc.* 57 USPQ2d 1057, 1061 (Fed. Cir. 2000) (*relying on Electro Med. Sys. S.A. v. Cooper Life Scis.*, 32 USPQ2d 1017, 1019 (Fed Cir. 1994) (Emphasis added).

Applicants respectfully submit that, as understood by those skilled in the art, the Astra Aktiebolag discussion of ethyl carbonate derivatives (e.g. substituted, ethoxycarbonyloxymethyl derivatives) of omeprazole, with specific focus on the 5-

methoxy compound, does not teach or suggest 6-methoxy-2-[[*(S)*-(4-methoxy-3,5-dimethyl-2-pyridinyl)methyl]sulfinyl]-1*H*-benzimidazole in pure form.

Accordingly, Applicants respectfully submit that Claims 65-84 are not anticipated by Astra Aktiebolag, and Applicants respectfully request that this rejection be withdrawn.

**V. Nonstatutory Double Patenting Rejection**

Applicants reiterate the intention to submit a terminal disclaimer upon indication that the pending claims are allowed. Again, Applicants' offer to submit the terminal disclaimer should not be construed as an admission with respect to the nonstatutory double patenting rejections or the Examiner's characterization of Applicants' cited patents as set forth in the previous Office Action.

**Conclusion**

At least in view of the foregoing remarks, Applicants respectfully request that all outstanding rejections to the claims be withdrawn and that a Notice of Allowance be issued in due course.

The Examiner is invited and encouraged to contact the undersigned directly if such contact will expedite the prosecution of the pending claims to issue. In any event, any questions that the Examiner may have should be directed to the undersigned, who may be reached at (919) 854-1400.

Respectfully submitted,



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(12) **United States Patent**  
Whittle et al.

(10) **Patent No.: US 6,706,737 B2**  
(45) **Date of Patent: \*Mar. 16, 2004**

(54) **ALKOXY SUBSTITUTED BENZIMIDAZOLE COMPOUNDS, PHARMACEUTICAL PREPARATIONS CONTAINING THE SAME, AND METHODS OF USING THE SAME**

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(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **10/434,259**

(22) Filed: **May 8, 2003**

(65) **Prior Publication Data**

US 2003/0225136 A1 Dec. 4, 2003

**Related U.S. Application Data**

(63) Continuation of application No. 10/189,659, filed on Jul. 3, 2002, which is a continuation of application No. 10/057,659, filed on Jan. 25, 2002, now Pat. No. 6,444,689, which is a continuation of application No. 09/645,145, filed on Aug. 24, 2000, now Pat. No. 6,369,087, which is continuation-in-part of application No. 09/519,976, filed on Mar. 7, 2000, now Pat. No. 6,262,085.

(60) Provisional application No. 60/150,878, filed on Aug. 26, 1999.

(51) Int. Cl.<sup>7</sup> ..... **A61K 31/44**

(52) U.S. Cl. ..... **514/338**

(58) Field of Search ..... **514/338**

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

4,128,658 A	12/1978	Price et al.	.....	424/285
4,255,431 A	3/1981	Junggren et al.	.....	424/263
4,279,819 A	7/1981	Price et al.	.....	260/326.5 S
4,337,257 A	6/1982	Junggren et al.	.....	424/263
4,508,905 A	4/1985	Junggren et al.	.....	546/271
4,555,518 A	11/1985	Rainer	.....	514/338
4,596,795 A	6/1986	Pitha	.....	514/58
4,612,378 A	9/1986	Bosshard et al.	.....	548/170
4,620,008 A	10/1986	Brändström et al.	.....	546/271
4,628,098 A	12/1986	Nohara et al.	.....	546/271
4,636,499 A	1/1987	Brändström et al.	.....	514/222
4,725,691 A	2/1988	Brändström et al.	.....	546/172
4,727,064 A	2/1988	Pitha	.....	514/58
4,738,974 A	4/1988	Brändström	.....	514/338
4,753,955 A	6/1988	Matsuishi et al.	.....	514/338
4,772,619 A	9/1988	Adelstein et al.	.....	514/338
4,777,172 A	10/1988	Ife et al.	.....	514/234.5
4,786,505 A	11/1988	Lovgren et al.	.....	424/468
4,808,596 A	2/1989	Matsuishi et al.	.....	514/303

4,820,708 A	4/1989	Iff et al.	.....	514/232.8
4,840,799 A	6/1989	Appelgren et al.	.....	424/493
4,853,230 A	8/1989	Lovgren et al.	.....	424/466
5,021,443 A	6/1991	Bru-Magniez et al.	.....	514/394
5,045,321 A	9/1991	Makino et al.	.....	424/475
5,070,101 A	12/1991	Kaminski	.....	514/399
5,075,323 A	12/1991	Fain et al.	.....	514/338
5,093,132 A	3/1992	Makino et al.	.....	424/475
5,093,342 A	3/1992	Tomoi et al.	.....	514/328
5,096,893 A	3/1992	Pitha et al.	.....	514/58
5,106,863 A	4/1992	Hajos et al.	.....	514/395
5,124,158 A	6/1992	Ruwart et al.	.....	424/449
5,178,867 A	1/1993	Guitard et al.	.....	424/473
5,196,205 A	3/1993	Borody	.....	424/653
5,204,118 A	4/1993	Goldman et al.	.....	424/489
5,206,025 A	4/1993	Courteille et al.	.....	424/439
5,219,870 A	6/1993	Kim	.....	514/338
5,232,706 A	8/1993	Paloma Coll	.....	424/475
5,244,670 A	9/1993	Upson et al.	.....	424/439
5,246,714 A	9/1993	Dahlinder et al.	.....	424/497
5,288,506 A	2/1994	Spickett et al.	.....	424/498
5,294,439 A	3/1994	Yamasaka et al.	.....	424/78.01
5,294,629 A	3/1994	Machinami et al.	.....	514/366
5,304,540 A	4/1994	Blackburn et al.	.....	514/2
5,352,688 A	10/1994	Kaminski	.....	514/357
5,362,424 A	11/1994	Lee et al.	.....	264/4.3
5,374,730 A	12/1994	Slemon et al.	.....	546/271
5,385,739 A	1/1995	Debregas et al.	.....	424/494

(List continued on next page.)

**FOREIGN PATENT DOCUMENTS**

DE	4035455 A1	5/1992	.....	C07D/401/12
EP	0124495 A2	11/1984	.....	C07D/401/12
EP	0166287 B1	1/1986	.....	C07D/401/12
EP	0171372 A1	2/1986	.....	C07D/513/14
EP	0197013 A1	10/1986	.....	C07D/401/12
EP	0484265 A1	5/1992	.....	C07D/401/12

(List continued on next page.)

**OTHER PUBLICATIONS**

"The Mechanism of Action of the Gastric Acid Secretion Inhibitor Omeprazole," *Journal of Medicinal Chemistry* 29:8 1327-1329 (1986).

Beckett et al., "4-Hydroxybenzazoles: Preparation and Antibacterial Activities," *J. Pharm. and Pharmacol* 8:661-665 (1956).

Brändström et al., "Structure activity relationships of substituted benzimidazoles," *Scandinavian Journal of Gastroenterology* 20:Supplemental 108 15-22 (1985).

Brändström et al.; "Chemical Reactions of Omeprazole and Omeprazole Analogues. I. A Survey of the Chemical Transformations of Omeprazole and its Analogues," *Acta Chemica Scandinavica* 43:536-548 (1989).

(List continued on next page.)

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(57) **ABSTRACT**

Compounds represented by formula (Ia) are disclosed by the invention, along with compositions and complexes thereof, optionally in combination with compounds of formula (Ib). Pharmaceutical formulations and methods of making and using such compounds are also disclosed.

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U.S. PATENT DOCUMENTS			WO	WO 95/32957	12/1995	..... C07D/401/12	
			WO	WO 96/01622	1/1996	..... A61K/9/24	
5,386,032 A	1/1995	Brändström .....	546/271	WO	WO 96/01623	1/1996	..... A61K/9/26
5,391,752 A	2/1995	Hoerrner et al. ....	546/271	WO	WO 96/02535	2/1997	..... C07D/401/12
5,399,700 A	3/1995	Min et al. ....	546/271	WO	WO 97/20851	6/1997	..... C07F/7/08
5,417,980 A	5/1995	Goldman et al. ....	424/464	WO	WO 97/25030	7/1997	..... A61K/9/46
5,433,959 A	7/1995	Makino et al. ....	424/475	WO	WO 98/19668	5/1998	..... A61K/9/50
5,476,669 A	12/1995	Borody .....	424/653	WO	WO 98/53803	12/1998	..... A61K/9/28
5,508,041 A	4/1996	Lee et al. ....	424/451	WO	WO 98/54171	12/1998	..... C07D/401/12
5,514,660 A	5/1996	Zopf et al. ....	514/25	WO	WO 99/08500	2/1999	
5,518,730 A	5/1996	Fuisz .....	424/426				
5,536,735 A	7/1996	Takechi et al. ....	514/338				
5,571,811 A	11/1996	Heeres et al. ....	514/252				
5,578,732 A	11/1996	Kato et al. ....	546/273.7				
5,582,837 A	12/1996	Shell .....	424/451				
5,589,491 A	12/1996	Nakanishi et al. ....	514/338				
5,599,794 A	2/1997	Eek et al. ....	514/29				
5,616,593 A	4/1997	Patel et al. ....	514/321				
5,620,964 A	4/1997	Roth et al. ....	514/53				
5,622,717 A	4/1997	Fuisz .....	424/488				
5,629,305 A	5/1997	Eek et al. ....	514/199				
5,633,244 A	5/1997	Eek et al. ....	514/199				
5,635,520 A	6/1997	Uda .....	514/338				
5,637,592 A	6/1997	Heeres et al. ....	514/252				
5,639,478 A	6/1997	Makino et al. ....	424/475				
5,639,754 A	6/1997	Heeres et al. ....	514/252				
5,650,411 A	7/1997	Heeres et al. ....	514/252				
5,651,987 A	7/1997	Fuisz .....	424/488				
5,656,286 A	8/1997	Miranda et al. ....	424/449				
5,665,730 A	9/1997	Senn-Bilfinger et al. ....	514/300				
5,670,932 A	9/1997	Kizima .....	340/384.6				
5,686,588 A	11/1997	Yoo .....	536/13.3				
5,693,818 A	12/1997	Von Unge .....	546/273.7				
5,710,156 A	1/1998	Heeres et al. ....	514/255				
5,714,504 A	2/1998	Lindberg et al. ....	514/338				
5,719,161 A	2/1998	Rainer .....	514/300				
5,728,700 A	3/1998	Heeres et al. ....	514/252				
5,731,002 A	3/1998	Olovson et al. ....	424/484				
5,753,630 A	5/1998	Zopf et al. ....	514/25				
5,766,622 A	6/1998	Nelson .....	424/440				
5,776,765 A	7/1998	Graham et al. ....	435/280				
5,811,426 A	9/1998	Heeres et al. ....	514/252				
5,811,547 A	9/1998	Nakamichi et al. ....	540/589				
5,817,338 A	10/1998	Bergstrand et al. ....	424/468				
5,840,552 A	11/1998	Holt et al. ....	435/118				
5,846,562 A	12/1998	Yanai et al. ....	424/451				
5,859,030 A	1/1999	Kohl et al. ....	514/338				
5,877,192 A	3/1999	Lindberg et al. ....	514/338				
5,916,904 A	6/1999	Sato et al. ....	514/338				
5,929,244 A	7/1999	Von Unge .....	546/273.7				
5,948,789 A	9/1999	Larsson et al. ....	514/299				
6,262,085 B1	7/2001	Whittle et al. ....	514/338				
6,262,086 B1	7/2001	Whittle et al. ....	514/338				
6,268,385 B1	7/2001	Whittle et al. ....	514/338				

## FOREIGN PATENT DOCUMENTS

EP	0585722 A1	3/1994	..... A61K/31/44				
JP	61007281 A2	1/1986	..... C07D/513/14				
JP	61205211	9/1986	..... A61K/31/44				
JP	61271259	12/1986	..... C07C/93/14				
JP	02049774 A2	2/1990	..... C07D/235/28				
JP	06096581	4/1994	..... G11C/114/01				
JP	06316573	11/1994	..... C07D/401/12				
WO	WO 89/03829	5/1989	..... C07D/401/12				
WO	WO 92/08716	5/1992	..... C07D/401/12				
WO	WO 93/21920	11/1993	..... A61K/31/44				
WO	WO 94/02141	2/1994	..... A61K/31/44				
WO	WO 94/27988	12/1994	..... C07D/401/12				
WO	WO 95/01783	1/1995	..... A61K/9/24				
WO	WO 95/01977	1/1995	..... C07D/401/12				
WO	WO 95/18612	7/1995	..... A61K/31/44				

## OTHER PUBLICATIONS

Brändström et al.; "Chemical Reactions of Omeprazole and Omeprazole Analogues. II. Kinetics of the Reaction of Omeprazole in the Presence of 2-Mercaptoethanol," *Acta Chemica Scandinavica* 43:549-568 (1989).

Brändström et al.; "Chemical Reactions of Omeprazole and Omeprazole Analogues. III. Protolytic Behaviour of Compounds in the Omeprazole System," *Acta Chemica Scandinavica* 43:569-576 (1989).

Brändström et al.; "Chemical Reactions of Omeprazole and Omeprazole Analogues. IV. Reactions of Compounds of the Omeprazole System with 2-Mercaptoethanol," *Acta Chemica Scandinavica* 43:577-586 (1989).

Brändström et al.; "Chemical Reactions of Omeprazole and Omeprazole Analogues. V. The Reaction of N-Alkylated Derivatives of Omeprazole Analogues with 2-Mercaptoethanol," *Acta Chemica Scandinavica* 43:587-594 (1989).

Brändström et al.; "Chemical Reactions of Omeprazole and Omeprazole Analogues. VI. The Reactions of Omeprazole in the Absence of 2-Mercaptoethanol," *Acta Chemica Scandinavica* 43:595-611 (1989).

Clissold et al.; "Omeprazole A Preliminary Review of its Pharmacodynamic and Pharmacokinetic Properties, and Therapeutic Potential in Peptic Ulcer Disease and Zollinger-Ellison Syndrome," *Drugs* 32:15-47 (1986).

Erlandsson; "Resolution of the enantiomers of omeprazole and some of its analogues by liquid chromatography on a trisphenylcarbamoylcellulose-based stationary phase. The effect of the enantiomers of omeprazole on gastric glands," *Journal of Chromatography* 532:305-319 (1990).

Lindberg et al., "Structure-activity relationships of omeprazole analogues and their mechanism of action," *TIPS* 8:399-402 (Oct. 1987).

Maier et al.; "Diphenylethanediamine (DPEDA) Derivatives as Chiral Selectors: IV. A Comparison of 3,5-Dinitrobenzoylated (S,S)- and (S,R)-DPEDA-Derived Chiral Stationary Phases with Pirkle's Standard (R)-Phenylglycine-Derived Phase in Normal Phase HPLC," *Chirality* 6:116-128 (1994).

Marle et al.; "Separation of enantiomers using cellulase (CBH I) silica as a chiral stationary phase," *Journal of Chromatography* 582:233-248 (1991).

Marle et al.; "Chiral stationary phases based on intact and fragmented cellobiohydrolase I immobilized on silica," *Journal of Chromatography* 648:333-347 (1993).

Ohishi et al.; "Structure of 5-Methoxy-2-[4-methoxy-3,5-dimethyl-2-pyridinyl]methyl]-sulfanyl]-1H-benzimidazole (Omeprazole)," *Acta Cryst.* C45:1921-1923 (1989).

Sachs et al.; "Gastric H,K-ATPase as Therapeutic Target," *Ann. Rev. Pharmacol. Toxicol.* 28:269-284 (1988).

Uray et al.; "Diphenylethanediamine derivatives as chiral selectors VIII. Influence of the second amido function on the high-performance liquid chromatographic enantioseparation characteristics of (*N*-3,5-dinitrobenzoyl)-diphenylethanediamine based chiral stationary phases," *Journal of Chromatography A* 799:1+2 67-81 (Mar. 1998).  
von Unge et al.; "Stereochemical assignment of the enantiomers from X-ray analysis of a fenchyloxymethyl derivative of (+)-(R)-omeprazole," *Tetrahedron: Asymmetry* 8:12 1967-1970 (1997).  
U.S. patent application No. 09/629,587 to Whittle, et al. entitled *Pharmaceutical Formulations*; filed Jul. 31, 2000.

U.S. patent application No. 09/628,840 to Whittle, et al. entitled *Method of Improving Bioavailability*; filed Jul. 31, 2000.

U.S. patent application No. 09/629,634 to Whittle, et al. entitled *Pharmaceutical Unit Dosage Form*; filed Jul. 31, 2000.

U.S. patent application No. 09/645,148 to Whittle, et al. entitled *Dry Blend Pharmaceutical Unit Dosage Form*; filed Aug. 24, 2000.